

Work Order # \_\_\_\_\_ Job # \_\_\_\_\_ Activity # \_\_\_\_\_

1. Work requester fills out this section

STANDING WORK PERMIT ☐

Requester: P Kroon Date: 10/9/01 Ext. 5714 Dept/Div/Group: Physics  
Other Contact person (if different from requester): C. Pearson Ext. 4671  
Work Control Coordinator P Kroon Start Date 10/10/01 Est. End Date 10/12/01  
Description of Work / Problem: INSTALL 17UID SHIELDING INSIDE  
5M ID

Building 1008 Room --- Equipment --- Service Provider ---

2. Work requester, service provider, and ES&H (as necessary) fill out this section or attach analysis

**ES&H Analysis**

Area to be surveyed before de-posting  
**RADIATION CONCERNS** ☒ NONE ☐ Activation ☐ Airborne ☐ Contamination ☐ Radiation ☒ OTHER  
☐ Special nuclear materials involved, notify Isotope Special Materials Group ☐ Fissionable materials involved, notify Laboratory Criticality Officer

**SAFETY CONCERNS**

☒ NONE  
☐ Adding / Removing Walls or Roofs ☐ Confined Space\* ☐ Explosives ☐ Lead\* ☐ Penetrating Fire Wall  
☐ Asbestos\* ☐ Corrosive ☐ Flammable ☐ Magnetic Field (8 gauss) ☐ Pressurized Systems  
☐ Beryllium\* ☒ Electrical ☐ Fumes/Mist/Dust\* ☐ Material Handling ☐ Rigging/Critical Lift  
☐ Biohazard\* ☐ Elevated Work\* ☐ Hydraulic ☐ Noise\* ☐ Toxic Materials\*  
☐ Chemicals\* ☐ Excavation ☐ Lasers\* ☐ Non-ionizing Radiation ☒ Vacuum  
☐ Oxygen Deficiency\* ☐ OTHER \_\_\_\_\_

\*Does this work require medical clearance or surveillance from the Occupational Medicine Clinic? ☐ Yes ☒ No

**ENVIRONMENTAL CONCERNS**

☒ NONE ☐ Work impacts Environmental Permit No. \_\_\_\_\_  
☐ Atmospheric Discharges (rad/non-rad) ☐ Liquid Discharges ☐ Soil activation/contamination ☐ Waste - Mixed  
☐ Chemical or Rad Material Storage or Use ☐ Oil / PCB Management ☐ Waste - Clean ☐ Waste - Radioactive  
☐ Cesspools (UIC) ☐ Protected areas / species ☐ Waste - Hazardous ☐ Waste - Regulated Medical  
☐ High water / power consumption ☐ Spill potential ☐ Waste - Industrial ☐ OTHER \_\_\_\_\_

Waste disposition by: \_\_\_\_\_

**POLLUTION PREVENTION (P2) / WASTE MINIMIZATION OPPORTUNITY:** ☐ None ☒ Yes

**Facility Concerns**

☒ NONE ☐ Access/Egress Limitations ☐ Impacts Facility Use Agreement ☐ Temperature Change ☐ OTHER \_\_\_\_\_  
☐ Configuration Control ☐ Maintenance Work on Ventilation Systems ☐ Utility Interruptions  
☐ Electrical Noise ☐ Potential to Cause a False Alarm ☐ Vibrations

**Work Controls**

**WORK PRACTICES** ☒ NONE ☐ Exhaust Ventilation ☐ Lockout/Tagout ☐ Spill Containment  
☐ Back-up Person/Watch ☐ HP Coverage ☐ Posting/Warning Signs ☐ Time Limitation  
☐ Barricades ☐ IH Survey ☐ Scaffolding - requires inspection ☐ Warning alarm (i.e. "high level")

**PROTECTIVE EQUIPMENT**

☐ NONE ☐ Ear Plugs ☒ Gloves ☐ Lab Coat ☐ Safety Glasses  
☐ Coveralls ☐ Ear Muffs ☐ Goggles ☐ Respirator ☐ Safety Harness  
☐ Disposable Clothing ☐ Face Shield ☐ Hard Hat ☐ Shoe covers ☒ Safety Shoes ☐ OTHER \_\_\_\_\_

**PERMITS REQUIRED**  
(Please attach)

Initial next to box to show who has responsibility to generate the permit. Permits must be valid when job is scheduled.

☒ NONE ☐ Cutting/Welding ☐ Impair Fire Protection Systems  
☐ Concrete/Masonry Penetration ☐ Digging/Core Drilling ☐ Rad Work Permit - RWP No. \_\_\_\_\_  
☐ Confined Space Entry ☐ Electrical Working Hot ☐ OTHER \_\_\_\_\_

**DOSIMETRY/ MONITORING**

☒ NONE ☐ Heat Stress Monitor ☐ Real Time Monitor ☐ TLD  
☐ Air Effluent ☐ Noise Survey/Dosimeter ☐ Self-reading Pencil Dosimeter ☐ Waste Characterization  
☐ Ground Water ☐ O<sub>2</sub>/Combustible Gas ☐ Self-reading Digital Dosimeter ☐ OTHER \_\_\_\_\_  
☐ Liquid Effluent ☐ Passive Vapor Monitor ☐ Sorbent Tube/Filter Pump

**Training Requirements** (List below any location specific training requirements)

C-A Access, escort Policy

Based on analysis above, the Walkdown Team determines the risk, complexity, and coordination ratings below.

ES&H Risk Level: X LOW \_\_\_\_\_ MODERATE \_\_\_\_\_ HIGH \_\_\_\_\_  
Complexity Level: X LOW \_\_\_\_\_ MODERATE \_\_\_\_\_ HIGH \_\_\_\_\_  
Work Coordination: X LOW \_\_\_\_\_ MODERATE \_\_\_\_\_ HIGH \_\_\_\_\_

Note: If all the ratings are LOW, the Work Control Coordinator and Service Provider must sign for concurrence on the back side. Further review of the work permit is **not** required. If any ratings are MODERATE or HIGH, the entire permit must be completed.

3. Both work requester and service provider coordinate on work plan (use attachments for detailed plans)

**Work Plan:** (procedures, timing, equipment, and personnel availability need to be addressed) \_\_\_\_\_

*See Attached*

Special Working Conditions Required: *None*

Operational Limits Imposed: \_\_\_\_\_

Post Work Testing Required: \_\_\_\_\_

Job Safety Analysis Required ☒ Yes ☐ No

Walkdown Required ☐ Yes ☒ No

**Reviewed By:** Primary Reviewer will determine the size of the review team and the other signatures required based on hazards and job complexity. Primary Reviewer signature means that the hazards and risks that could impact ES&H have been identified and will be controlled according to BNL requirements.

Title	Name (print)	Signature	Life #	Date
Primary Reviewer	<i>Y. Ito Kdici</i>	<i>[Signature]</i>	15535	10/9/01
ES&H Professional				
Other	<i>P. KROON</i>	<i>Peter K</i>	17500	10/9/01
Other	<i>C. PERSON / A. PONDZICK</i>	<i>[Signature]</i>	12415	10/9/01
Work Control Coordinator*	<i>P. KROON</i>	<i>Peter K</i>	17500	10/9/01
Service Provider*				

\*Only signatures required for concurrence on LOW rated jobs.

Review done: in series team

4. Job site personnel fills out this section

Note: Signature indicates personnel performing work have read and understand the hazards and permit requirements (including attached permits).

Job Site Supervisor *See Attached*

Contractor Supervisor \_\_\_\_\_

Workers: *See Attached* Life # \_\_\_\_\_

Workers: \_\_\_\_\_ Life # \_\_\_\_\_

Workers are encouraged to provide feedback on ES&H concerns or on ideas for improved job work flow. Use feedback form or space below.

5. Work Requester or designee fills out this section

**Conditions are Appropriate to Start Work:** (Work permit has been reviewed, work controls are in place, and site is ready for job.)

Name *P. KROON* Signature *Peter K* Life # *17500* Date *10/9/01*

6. Work Requester determines if Post Job Review is required ☐ No ☐ Yes (Fill in names of reviewers)

**Post Job Review:**

Name: \_\_\_\_\_ Signature \_\_\_\_\_ Life #: \_\_\_\_\_ Date: \_\_\_\_\_

Name: \_\_\_\_\_ Signature \_\_\_\_\_ Life #: \_\_\_\_\_ Date: \_\_\_\_\_

7. Worker provides feedback

**Worker Feedback:** \_\_\_\_\_

8. Work Control Coordinator (requesting dept.) checks quality of completed permit and closes out

**Closeout:** Name \_\_\_\_\_ Signature \_\_\_\_\_ Life #: \_\_\_\_\_ Date: \_\_\_\_\_

Comments: \_\_\_\_\_

## Memo

date: October 9, 2001

to: Derek Lowenstein

from: Yousef Makdisi (on behalf of the Experiment Safety Review Committee)

subject: Recommendation for approval to install the steel shielding inside the MuID hole.

The PHENIX detector proposes to install a 6 inch thick shield liner on the inside of the MuID south square hole. The liner involves the base and two side walls.

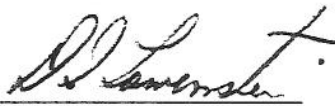
- An installation plan including engineering drawings was submitted and reviewed by Pearson and Makdisi on Oct 8, 2001.
- A meeting was held by PHENIX on October 9, 2001 to detail the plan to the primary overseers.
- A list of "responsible persons" who will supervise the job was also submitted.
- An escort policy is in effect for the duration of the work in the tunnel.
- The DX magnetic fringe field was measured by Cirnigliaro and Etkin on October 9, 2001. Less than 100 gauss and slow gradient.
- CAS watch will be notified of the work.
- A work plan will be signed prior to commencing the work on October 10, 2001.
- Safety shoes as well as leather gloves will be worn by all those involved in the installation.

I request approval for installation of the MuID south shield walls. All relevant documentation is in the C-AD Experiment Safety Review Committee files.

cc:

E. O'Brien  
P. Kroon  
C. Pearson  
P. Pile

File

Approved: 

Date: 10/9/01

# Static Magnetic Fields Exposure Form

## Part B: Field Strength Measurement Record

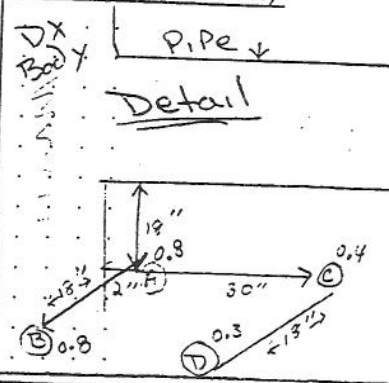
Continuation of Section III.

INDICATE WHERE READINGS WERE TAKEN IN THE TABLE BELOW AND ON THE SKETCH (GRID) BELOW. EQUIVALENT METHODS OF DOCUMENTATION CAN BE ATTACHED (E.G., PICTURE, PLAN VIEW WITH EXPOSURE LEVEL INDICATED)

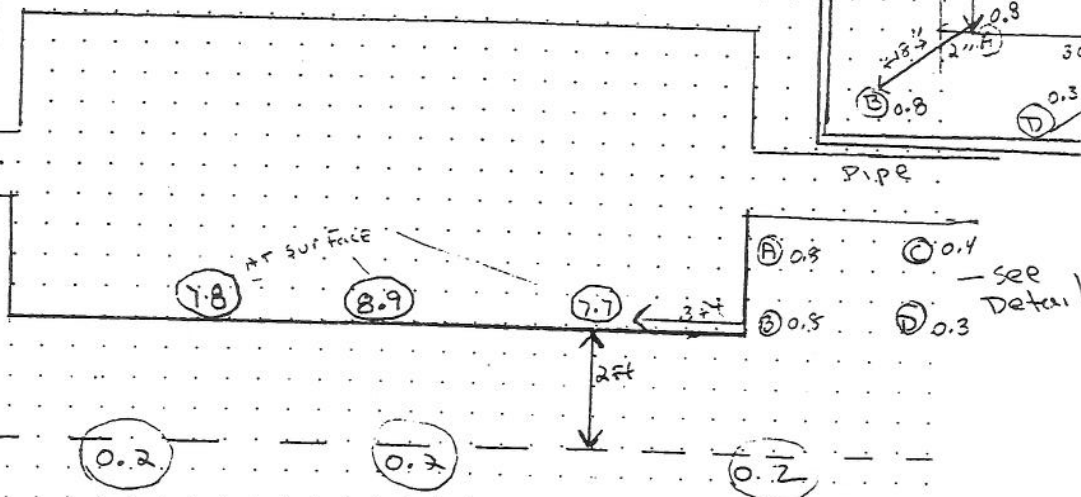
DISTANCE FROM SOURCE	LOCATION	READING	COMMENTS

Sketch of Survey Area. (Indicate positions on map where measurements were made.)

*DX @ 12 o'clock*



*IRL*



MEASUREMENTS IN mT  
0.1 mT = 1.0 Gauss

Symmetrical Magnet - Inside of Arc equivalent field

Forward the original form to the Static Magnetic Fields Subject Matter Expert, copies to your ES&H Coordinator and Facility Support Representative. Retain a copy in your files. Update and resubmit the assessment when changes occur.

FILE CODE: IH95SR.

FORM IH-SMF (v1.0)

## MuID Shielding Installation Plan - REVC.

The idea is to cover the floor and sides of the opening with 6 inches of steel. The z-coverage is 63 inches, enough to overlap the MuID steel for gaps 2 and 5 by ~ 1+ inch. The walls are built in two vertical sections, 24 inches wide and 39 inches wide, with the 24 inch section on the south end for independent removal to make it possible to regain access to the interior. Floor and walls are made up of stacked "bricks", 1/2 inch thick.

Six different size bricks are used, 3 for the floor and 2 for the walls and 1 for both. The quantities, sizes and weights are:

Q	Size - in	Wt. Lb.
24	12x27	49
48	6x36	33
64	6x30	27
36	6x18	17
192	6x15	14
336	6x24	22

Before any plates are put in the opening, some unistrut has to be removed from the north end where it overhangs gap #2 where the shielding wall goes. A few tapped holes will be needed to support unistrut extensions over gap #5 on the east wall. Also, all the bolts in the existing floor plate except the four corners get removed, and some of the MuID electronics gets covered by plastic sheet. We also plan a 2-inch extension of the existing aluminum floor plate to avoid overhanging the edge with the steel plates.

The entire cavity will be checked again to make sure wires are as out of the way as possible. Everyone should be aware that the ion pump high voltage will remain on during this period.

The plates can be carried in and staged on the concrete sill by size while the opening is being prepared. I have arranged the size listing above to correspond to the order of use, i.e. the 12x27 are first, then 6x36 etc.

Drawings will be posted showing what goes where, and we may have to improvise a little on the floor to get around the ion pump extensions that weren't on the drawing, but we have a few spare 6x24's that can be used. The 24 heaviest pieces go on the floor beside the ion pump and are the first ones to go in. All the 6x24 and 6x15 are used on the walls, so they can go into the tunnel after the other sizes.

After the floor is finished, we will put up vertical unistruts to support the walls, and lay 8-inch channel on the floor as a base for the walls. The walls come next, starting with the west wall, north end, up to 36 inches. Bent sheet steel "clips" will be used periodically (every 16 inches?) to tie the wall to the unistrut as it rises. At some point (where needed, maybe at 24 inches?) another channel is planned to re-establish a reasonable base for the

rest of the wall, if it is needed. The south end of the west wall goes next in the same manner. Then the final 12 inches of the north end is completed using 6x30 and 6x15 bricks. This leaves the south end of the wall short to miss the vacuum valve.

After the west wall, the north end of the east wall gets built to full height of 48 inches above the floor. The south end of the east wall is last, and probably needs to be built completely from outside. This section is made up entirely of 6x24 inch bricks.

The trial wall was stacked Friday using 96 of the 6x24 bricks to the full height of 48 inches. This represents about 1/6 of the two walls (by number of bricks). We only used two clips, one about halfway up and one at the top. No surprises. In general the bricks are very flat and stackable, though some of them have a noticeable crown. The worst of these should be saved for the tops, and all of these should be stacked crown up to maximize stability.

Pete



## **GUIDELINES**

### **No Accidents**

**Don't work tired, don't rush – we have plenty of time and help.**

**Wear safety shoes, but don't expect them to protect your feet**

**No heroics – this is not a contest or a race.**

**At least one blue card holder must be in the tunnel for every ten workers**

**At least one of the “responsible persons” must be there at all times work is going on. (Marino, LaBounty, Shea, Biggs, Cianciolo, Kroon)**

**The run shift leader must be kept up to date on tunnel activities.**

## **STEPS**

Restricted access starts at 0800 Wed AM.

### **Outside Cavity**

Start "bucket brigade" to get plates into tunnel and stacked by size on the sill. Continue until all plates are in. – Organizer -

### **Inside Cavity**

Cover sensitive MuID parts with plastic sheet – Atsushi

Remove MuID panel restraints attached to aluminum floor plate – Atsushi

Remove all other bolts in floor except four corners – Atsushi or Sal

Remove two vertical unistruts from north end and cut off 4 horizontal ends – Sal/Jim

Check cavity for wires and anything else sensitive or in the way - Sal

Drill and tap two 3/8-16 holes in southeast MuID steel plate to anchor extensions to existing horizontal unistruts (top and second one up from bottom) – Jim

Start Floor stack with 12x27 plates to east and west of ion pump – must leave 1 cm or more between pump and bricks

Complete floor per layouts

Install vertical unistrut supports – two for each of four wall sections, located by available space on horizontal unistruts. May save southeast two for later to keep entrance open.

Install unistrut spacers

Install 64-inch channel at base of each wall, clipped to unistruts.



Stack northwest wall section (39 inches in "z") up to 18 inches. The first course should start centered E-W in the channel (about one inch inside channel extremity).

Attach 39 inch Z-clip to unistruts and stack the next 18 inches.

Attach another 39-inch Z-clip to unistrut.

Stack southwest wall in same manner using the 24-inch Z-clips– stop before exceeding height of northwest section and before hitting vacuum valve.

Complete the northwest section to 48 inches above floor and cap with Z-clip.

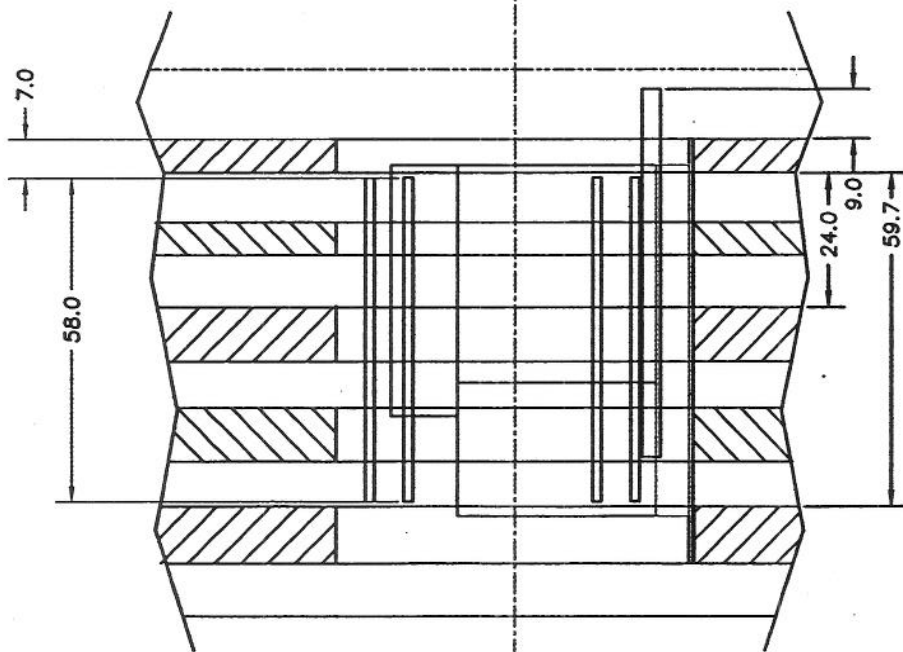
Stack complete northeast wall section in same manner.

Clean up in side of cavity and stack last section from outside, using same scheme.

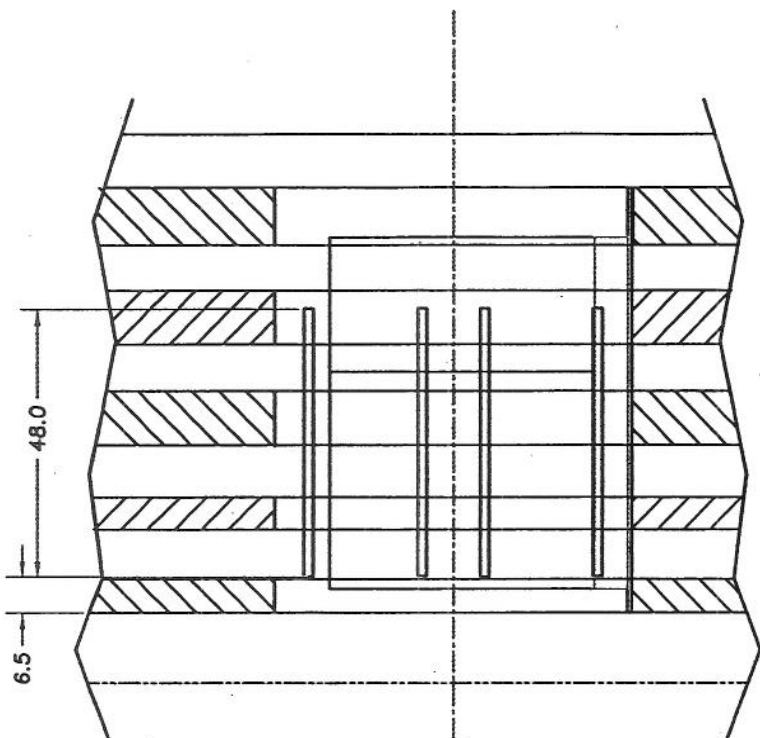
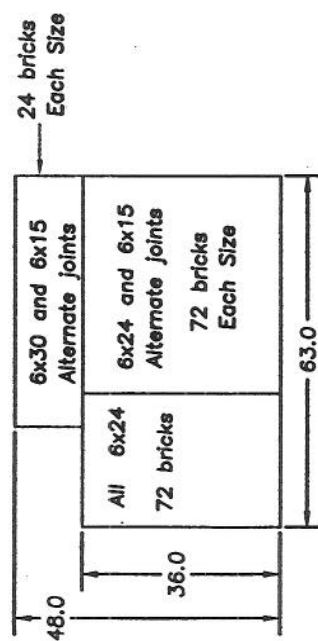
## COMMENTS

At each Z-clip level, check for flatness of wall as base for rest. One channel section is available to place on top of the z-clip if it would provide a better base.

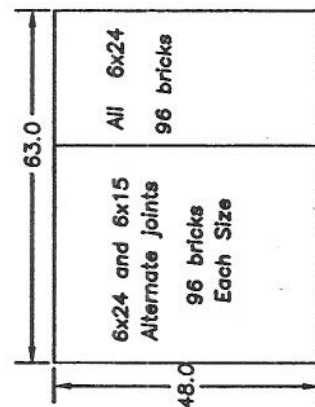
Spacers are provided up most of the vertical unistruts so the plates can be stacked against them to help keep everything aligned. However there are significant gaps for clips where it's up to the stacker to keep things lined up. N-S alignment is also important since each wall is in two sections.

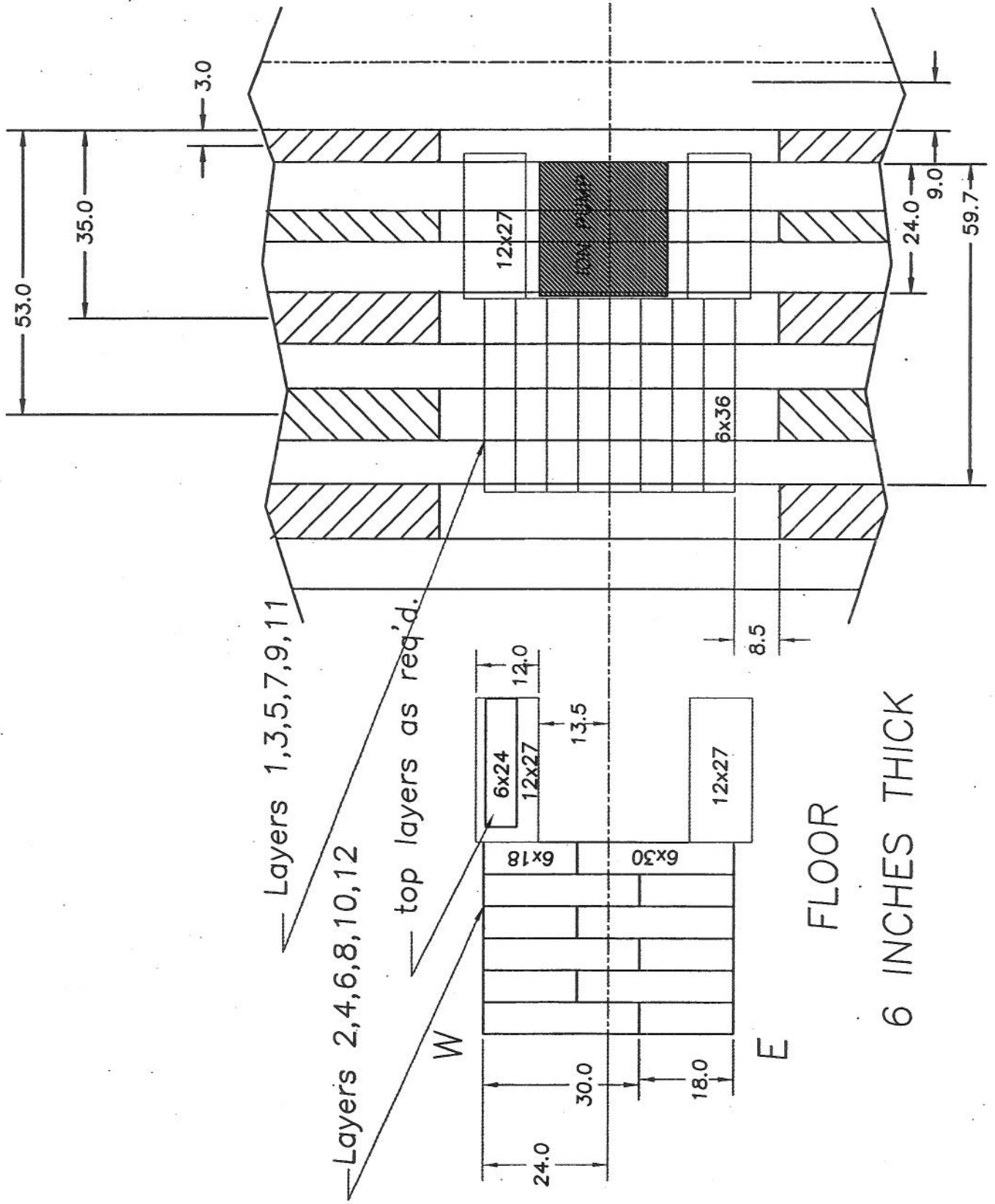


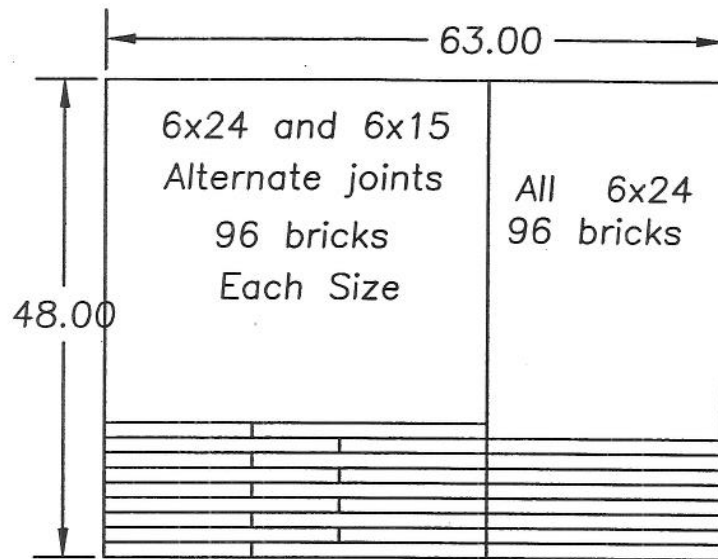
VIEW LOOKING WEST



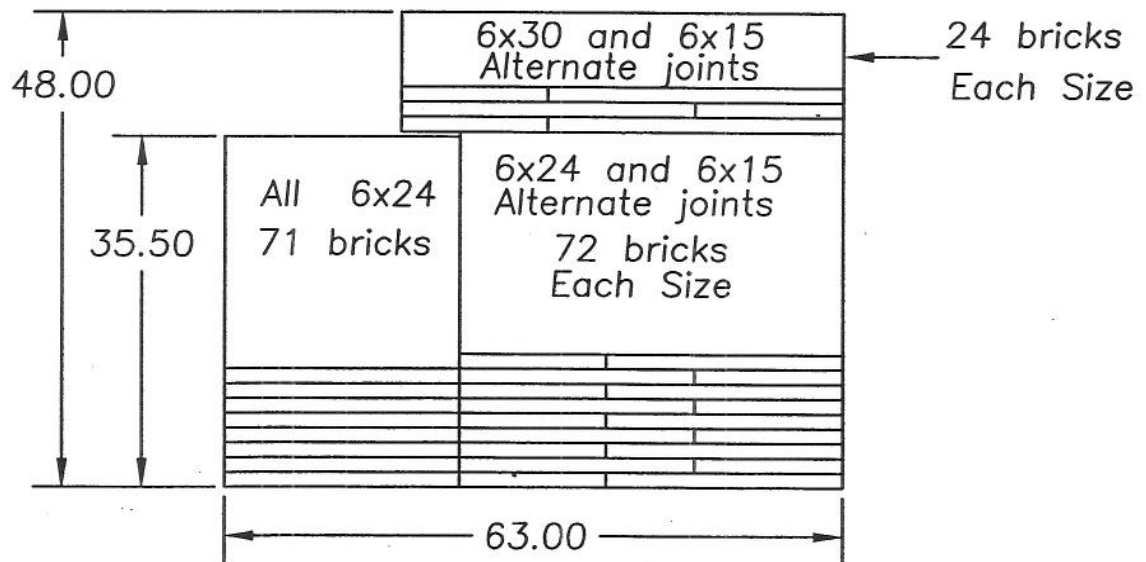
VIEW LOOKING EAST







EAST WALL  
VIEW LOOKING EAST



WEST WALL  
VIEW LOOKING WEST

